

TOSS-UP

1. ASTRONOMY: Multiple Choice: What astronomical phenomenon did Rudolph Wolf count by adding 10 times the number of groups of them he saw to the number of single ones he saw?

- W) supernovae
- X) asteroids
- Y) meteor showers
- Z) sunspots

ANSWER: **Z) sunspots** (Wolf sunspot number)

BONUS

1. ASTRONOMY: Multiple Choice: The periodic nature of eclipses is governed by a cycle called the "saros" cycle that, to the nearest year, lasts how long?

- W) 7 years
- X) 11 years
- Y) 18 years
- Z) 26 years

ANSWER: **Y) 18** years (11 days, 8 hours)

TOSS-UP

2. BIOLOGY: Short Answer: He proved that fermentation does not require oxygen and that the idea of spontaneous generation is not true. Name this French scientist that may be most famous for his idea that boiling liquid kills bacteria.

ANSWER: Louis **Pasteur**

BONUS

2. BIOLOGY: Short Answer: As a child, he learned to dive to the bottom of a lake. As an adult, he won two Academy Awards for his documentaries about oceanography. Name this French scientist who co-invented the first scuba-diving equipment and used it while diving off his ship *Calypso*.

ANSWER: Jacques-Yves **Cousteau** [coo-STOW]

TOSS-UP

3. MATH: Short Answer: What nickname often used for the "Gaussian" [GOW-see-un] or "normal" distribution comes from how it looks when graphed?

ANSWER: bell-shaped curve

BONUS

3. MATH: Short Answer: The equation $y = x^3 + 3x^2$ has a point of inflection or "saddle point" where x is equal to what value?

ANSWER: -1 (use 2nd derivative $6x + 6 = 0$)

TOSS-UP

4. PHYSICS: Short Answer: Russian students celebrate his birthday every May 7th by putting on an opera that tells of his possible career choices in ancient Greece besides physics. What physicist is quoted as saying, "Give me a lever and a place to stand, and I will move the world"?

ANSWER: Archimedes [ar-ka-MEE-deez]

BONUS

4. PHYSICS: Short Answer: For particles, it's the product of the mass and the square of the distance from the axis of rotation. Name this ratio of torque to angular acceleration, usually represented by a capital I.

ANSWER: moment of inertia

TOSS-UP

5. GENERAL SCIENCE: Multiple Choice: Compound, electron, scanning electron and transmission electron are all types of:

- W) telescopes
- X) microscopes
- Y) beakers
- Z) centrifuges

ANSWER: X) microscopes

BONUS

5. GENERAL SCIENCE: Multiple Choice: What scientist famous for his theory of "punctuated equilibrium" and best-selling books was nicknamed "the Carl Sagan [SAY-gun] of biology"?

- W) Stephen Hawking
- X) Kary Mullis
- Y) Richard Feynman
- Z) Stephen Jay Gould

ANSWER: Z) Stephen Jay Gould

TOSS-UP

6. CHEMISTRY: Multiple Choice: Which of these scientists does NOT have a chemical element named for him?

- W) Albert Einstein
- X) J. Robert Oppenheimer
- Y) Niels Bohr
- Z) Enrico Fermi

ANSWER: X) J. Robert Oppenheimer

BONUS

6. CHEMISTRY: Short Answer: Its name comes from the Latin word for "ant" because it was first made in 1670 from distilled ants. Name this acid with formula CHOOH.

ANSWER: formic acid

TOSS-UP

7. EARTH SCIENCE: Multiple Choice: The warm humid wind that blows from Africa onto the northern Mediterranean and brings rain to southern Europe is known as the:

- W) chinook
- X) monsoon
- Y) sirocco
- Z) tundra

ANSWER: Y) sirocco

BONUS

7. EARTH SCIENCE: Short Answer: It is roughly bounded by Alaska, the west coast of the Americas, Japan, and Antarctica. Give the three-word term for this area of the Pacific Ocean that contains more than half of the world's active volcanoes.

ANSWER: Ring of Fire

TOSS-UP

8. MATH: Short Answer: Calculate the value of x if the three angles of a triangle are $(3x + 3)^\circ$, $(x - 6)^\circ$ and $(2x - 3)^\circ$.

ANSWER: 31 ($6x - 6 = 180$)

BONUS

8. MATH: Short Answer: Calculate the volume of a sphere with radius 6 inches, using "pi" in your answer if necessary.

ANSWER: 288 π cubic inches ($\frac{4}{3} \times 6 \times 6 \times 6 \times \pi$)

TOSS-UP

9. BIOLOGY: Short Answer: In the world of biology, GM does not mean "General Motors", but rather what two-word description of crops specifically designed to withstand disease?

ANSWER: Genetically Modified

BONUS

9. BIOLOGY: Multiple Choice: The spineless cactus and the Shasta daisy were just two of the hybrid plants created by:

- W) Booker T. Washington
- X) George Washington Carver
- Y) Luther Burbank
- Z) Gregor Mendel

ANSWER: Y) Luther Burbank

TOSS-UP

10. CURRENT EVENTS: Short Answer: Minnesota researchers announced in 2004 a new way to extract it from ethanol by using two metals used in a car's catalytic converters. Name this most abundant element in the universe.

ANSWER: hydrogen

BONUS

10. CURRENT EVENTS: Short Answer: In March 2004, the Canadian government admitted that during World War II, it conducted secret chemical experiments on more than 3,000 of its own soldiers, primarily involving what chlorine-and-sulfur compound, named for its yellow color?

ANSWER: mustard gas

TOSS-UP

11. ASTRONOMY: Multiple Choice: The name of Pluto's only satellite is:

- W) Titan
- X) Charon [CARE-un]
- Y) Oberon
- Z) Phobos

ANSWER: X) Charon

BONUS

11. ASTRONOMY: Short Answer: The ancients called it "Phosphorus" when seen in the morning and "Hesperus" at night. Name this planet that is the brightest object in Earth's sky other than the sun and the moon.

ANSWER: Venus

TOSS-UP

12. GENERAL SCIENCE: Multiple Choice: The process of removing the salt from sea water before drinking it is called:

- W) desalinization [dee-sal-a-na-ZAY-shun]
- X) purification
- Y) condensation
- Z) ionization

ANSWER: W) desalinization

BONUS

12. GENERAL SCIENCE: Short Answer: It happens to things that undergo extreme changes in temperature and have their outer layer come off. Give this word also used to mean "the process of getting rid of the dead outer layer of skin on your body."

ANSWER: exfoliation [ex-fo-lee-A-shun] (accept forms of the word)

TOSS-UP

13. CHEMISTRY: Short Answer: Discovered by Harold Urey, it produces the "heavy water" used in the nuclear industry when combined with oxygen. Name this isotope of hydrogen that has a mass number of two because of its neutron.

ANSWER: deuterium [doo-TEER-ee-um]

BONUS

13. CHEMISTRY: Short Answer: Four and a half times heavier than air, it is the most popular gas in strobe lamps and high-speed electronic flash bulbs. Name this "strange" element on the periodic table just below krypton and just above radon.

ANSWER: xenon

TOSS-UP

14. PHYSICS: Multiple Choice: Which of these units is used to measure inductance?

- W) millihenries
- X) picofarads
- Y) microns
- Z) kilometers

ANSWER: W) millihenries

BONUS

14. PHYSICS: Short Answer: What electrical parameter is commonly measured in farads [FAIR-adz]?

ANSWER: capacitance

TOSS-UP

15. MATH: Short Answer: For a complex number, it is the square root of the quantity (a squared plus b squared). Name this concept expressed with real numbers by putting a vertical line on each side.

ANSWER: absolute value

BONUS

15. MATH: Short Answer: When you multiply the annual interest rate (in percent) on a savings account by the number of years at that rate until your money is doubled, the result is always very close to what two-digit number?

ANSWER: 72

TOSS-UP

16. BIOLOGY: Multiple Choice: Its name comes from the Greek for "digestion." Identify this sac inside a cell that recycles the cell's waste products.

- W) endoplasmic reticulum
- X) cell membrane
- Y) mitochondria
- Z) lysosome

ANSWER: Z) lysosome

BONUS

16. BIOLOGY: Short Answer: What process involves a single strand of DNA passing its information to a strand of messenger RNA, which the latter then uses for protein synthesis?

ANSWER: transcription

TOSS-UP

17. EARTH SCIENCE: Short Answer: Its two main types are "advection" (which occurs when two currents of air meet each other) and "radiation", when cold nights cause the land surface to quickly lose heat. Name this cloud that collects at the surface of the earth and makes it difficult to drive a car.

ANSWER: fog

BONUS

17. EARTH SCIENCE: Short Answer: They are caused by vertical movements of the sea floor and not from the gravitational force that affects the tides. Give the Japanese term for these waves sometimes called "tidal waves" in English.

ANSWER: tsunami (tsoo-NAW-mee)

TOSS-UP

18. GENERAL SCIENCE: Multiple Choice: The process of saponification [sa-PON-a-fa-CAY-shun] is used most often when making what common consumer product?

- W) nylon
- X) gasoline
- Y) printer ink
- Z) soap

ANSWER: Z) soap

BONUS

18. GENERAL SCIENCE: Short Answer: Transistors in this state can't handle any more current. What term also describes a hydrocarbon without double or triple bonds but with as many single hydrogen bonds as possible?

ANSWER: saturated or saturation

TOSS-UP

19. CHEMISTRY: Multiple Choice: How many carbon atoms are in a molecule of propane?

- W) 2
- X) 3
- Y) 4
- Z) 5

ANSWER: X) 3 (C_3H_8)

BONUS

19. CHEMISTRY: Short Answer: One of their major characteristics is a delocalized pi orbital. They are used both as chemical solvents and as explosives, like TNT. Name this type of hydrocarbon whose simplest example is benzene.

ANSWER: aromatic hydrocarbon

TOSS-UP

20. MATH: Multiple Choice: The y-intercept value of the line $3x = 5y + 30$ is equal to:

- W) 10
- X) 6
- Y) -6
- Z) -10

ANSWER: Y) -6 ($y = 3/5 x - 6$)

BONUS

20. MATH: Multiple Choice: Mike was 22 years old when his son Steve was born. If the sum of their two ages now is 50, then Steve is now:

- W) 14 years old
- X) 22 years old
- Y) 28 years old
- Z) 36 years old

ANSWER: W) 14 years old ($2x + 22 = 50$; Mike is 36)

TOSS-UP

21. CURRENT EVENTS: Short Answer: The stock of Krispy Kreme Donuts dropped 30% on one day in 2004 after the company attributed lower profits to the large number of Americans who have stopped eating donuts as part of what popular type of diet?

ANSWER: low-carbohydrate (or Atkins) diet

BONUS

21. CURRENT EVENTS: Multiple Choice: A decade after it became the last state in America to get a WalMart, what state was put on a list of endangered places in 2004 because activists feel that too many WalMarts there have spoiled the views of its famed "green mountains"?

- W) Montana
- X) Vermont
- Y) Alaska
- Z) Wyoming

ANSWER: X) Vermont (the "Green Mountain State")

TOSS-UP

22. MATH: Short Answer: According to the Pythagorean Identity, what do the sine squared of x and the cosine squared of x always add up to?

ANSWER: 1

BONUS

22. MATH: Short Answer: Two of them can have a product of zero even if neither one is actually equal to zero. Give this term introduced by Arthur Cayley to describe a square or rectangular array of numbers.

ANSWER: matrix

TOSS-UP

23. BIOLOGY: Multiple Choice: If your usual body temperature is more than one degree below the standard 98.6, you may have lower-than-average levels of the hormones secreted by the:

- W) pituitary
- X) hypothalamus
- Y) pineal gland
- Z) thyroid

ANSWER: Z) thyroid

BONUS

23. BIOLOGY: Short Answer: It wasn't discovered until 1977 but is now known as one of the top causes of epidemic pneumonia. What disease is named for the 34 people who died from it after attending a Philadelphia convention?

ANSWER: Legionnaire's Disease

TOSS-UP

24. PHYSICS: Multiple Choice: The letter generally used to indicate enthalpy is a capital:

- W) E
- X) H
- Y) I
- Z) R

ANSWER: X) H

BONUS

24. PHYSICS: Short Answer: What two-word term is used for the amount of heat required (in calories) to raise the temperature of one gram of a substance by one degree Celsius?

ANSWER: specific heat

TOSS-UP

25. CHEMISTRY: Multiple Choice: What type of atomic reaction takes place when a large molecule is "cracked" into smaller molecules?

- W) mitosis
- X) fusion
- Y) dilation
- Z) fission

ANSWER: Z) fission

BONUS

25. CHEMISTRY: Multiple Choice: What law of chemistry can be written with the equation $V_1 \text{ over } T_1 = V_2 \text{ over } T_2$?

- W) Boyle's Law
- X) Gay-Lussac's Law
- Y) Charles' Law
- Z) Avogadro's Law

ANSWER: Y) Charles' Law

END OF ROUND 1